

# PATENT SPECIFICATION

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## PROVISIONAL SPECIFICATION

### Improvements relating to Electro-Dynamic Reproducers or Loud-Speaking Telephones of the Moving Coil Type

I, HARRY CLAUDE WILLSON, a British Subject, of Reproducers and Amplifiers Limited, Frederick Street, Wolverhampton, do hereby declare the nature of this invention to be as follows:—

This invention relates to electro-dynamic sound reproducers or loud-speaking telephones of the moving-coil type, and is particularly concerned with the centring arrangements for the moving coil in such instruments. The invention may be applied to permanent magnet instruments or instruments with energised magnets.

Some of the greatest difficulties in connection with both of these types have been encountered in centring the inner pole with respect to the outer or annular pole of the magnet system, and in preventing the entry of particles of foreign matter into the gap between the poles during assembly of the parts, and again in the efficient dust-proofing of the area of the air gap during and after assembly.

It has been suggested in reproducers in which a corrugated diaphragm or disc is employed as the centring member for the moving coil, to permit the relatively free escape of air which might be trapped between such corrugated disc and the front plate or annular pole of the magnet system, by providing a passage for air from that space to the outside, in which a ring of porous material is included of such a nature as to exclude the entry of dust or metallic particles, and yet to allow the passage of air so that in a sense it acts as an air filter. It has also been proposed to form a centring spider of two superposed layers of open mesh woven material such as muslin and to cement the layers together by means of an adhesive of such a nature that it impregnates the fibres.

According to the present invention, a corrugated centring member is employed which is itself of such a nature that it is capable of acting as an air filter. For

this purpose, the corrugated member is formed of two layers of fabric of a coarse or relatively coarse mesh, thus being provided with interstices which prevent the passage of solid particles of an appreciable size, and one of the layers is a complete annulus or disc with the central aperture removed and the other comprises an inner annulus but with parts outside the annulus cut away.

It is preferred to make such centring members of relatively open fabric such as muslin, impregnated with a medium such as a thermo-setting synthetic resin of such a nature that the temperature required for polymerisation is substantially above that at which the entire instrument is required to operate and which will, at the same time, impart the required elasticity to the finished component. Sufficient of the medium may be employed to impregnate or coat the fibres of the fabric without closing up the interstices, so that the finished member remains pervious to air and a separate ring of filtering material is not necessary. Then the disc may be corrugated, if desired, by a die in a heated mould so that it retains its corrugated shape.

In order that the invention may be clearly understood and readily carried into effect, an example of a centring disc made in accordance with the invention, will now be more fully described.

Two layers are stamped from a sheet of cheese-cloth, one as a complete annulus and the other as an inner annulus with three radial spokes. They are impregnated with a liquid synthetic resin such as that sold under the Registered Trade Mark Bakelite. The amount of liquid necessary to impregnate the material without rendering it impervious to air depends largely on the material to be impregnated but may be determined by a simple trial. In the case of Bakelite, a 30 to 40 per cent. solution has been found suitable and the required amount is deter-

mined by passing the material after impregnation and whilst still wet, through a pair of rollers which can be adjusted within fine limits to provide a gap between them so that, without exerting pressure on the material, they will remove the surplus liquid. It will be readily understood that according to the relative thickness of the weft and warp to the spaces between them and the nature of the thread from which the fabric is woven, various densities of solution will be required according to the nature of the material used for impregnation. After this process, the material may be cut into suitable lengths and suspended either in free air or suitable heated ovens to dry. The two layers after being cut to shape are superimposed with their warps inclined to one another, for example, at 45 degrees and are corrugated by being placed in a heated mould and compressed by a correspondingly shaped die. The resin is thus polymerised and renders the discs sufficiently resilient and their fibres waterproofed while the resulting spider is

still pervious to the flow of air but prevents the passage of solid particles of such a size as to impair the efficient operation of the sound reproducing instrument.

By using a spoked inner annulus cemented to a complete annulus as described it is possible to house the two leads to the voice coil of the instrument between two of the spokes of the one layer and the adjacent surface of the other layer. The third spoke may be similarly loaded with a strip merely for balancing purposes. It is also possible by making the second layer with spokes of appropriate width or an inner annulus of suitable diameter or both to obtain a centring member of desired stiffness and consequently giving the finished sound-reproducing instrument a main resonant frequency desired.

Dated this 14th day of July, 1947.

For the Applicant:

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### COMPLETE SPECIFICATION

#### Improvements relating to Electro-Dynamic Reproducers or Loud-Speaking Telephones of the Moving Coil Type

I, HARRY CLAUDE WILLSON, a British Subject, of Reproducers and Amplifiers Limited, Frederick Street, Wolverhampton, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to electro-dynamic sound reproducers or loud-speaking telephones of the moving-coil type, and is particularly concerned with the centring arrangements for the moving coil in such instruments. The invention may be applied to permanent magnet instruments or instruments with energised magnets.

Some of the greatest difficulties in connection with both of these types have been encountered in centring the inner pole with respect to the outer or annular pole of the magnet system, and in preventing the entry of particles of foreign matter into the gap between the poles during assembly of the parts, and again in the efficient dust-proofing of the area of the air gap during and after assembly.

It has been suggested in reproducers in which a corrugated diaphragm or disc is employed as the centring member for the moving coil, to permit the relatively free escape of air which might be trapped between such corrugated disc and the

front plate or annular pole of the magnet system, by providing a passage for air from that space to the outside, in which a ring of porous material is included of such a nature as to exclude the entry of dust or metallic particles, and yet to allow the passage of air so that in a sense it acts as an air filter. It has also been proposed to form a centring spider or two superposed layers of open mesh woven material such as muslin and to cement the layers together by means of an adhesive of such a nature that it impregnates the fibres.

According to the present invention, a corrugated centring member is employed which is itself of such a nature that it is capable of acting as an air filter. For this purpose, the corrugated member is formed of two layers of fabric of a coarse or relatively coarse mesh, thus being provided with interstices which prevent the passage of solid particles of such a size as to interfere with the free movement of the moving coil and each of the layers is an annulus or a disc with the central aperture removed, the second being of smaller radial depth than the first.

It is preferred to make such centring members of relatively open fabric such as muslin, impregnated with a medium such as thermo-setting synthetic resin of such a nature that the temperature required

for polymerisation is substantially above that at which the entire instrument is required to operate and which will, at the same time, impart the required elasticity to the finished component. In such a case, sufficient of the medium is employed to impregnate or coat the fibres of the fabric without closing up the interstices, so that the finished member remains pervious to air and a separate ring of filtering material is not necessary. Then the disc is corrugated by a die in a heated mould so that it retains its corrugated shape.

In order that the invention may be clearly understood and readily carried into effect, an example of a centring disc made in accordance with the invention, will now be more fully described with reference to the accompanying drawings, in which:—

Figure 1 is an elevation of the completed centring member seen from the inside of the loud-speaking telephone and with a portion of the complete annulus broken away; and

Figure 2 is an axial section of part of a loud-speaking telephone showing the centring member mounted in position, the centring member being shown in section on the line II—II in Figure 1.

Two layers are stamped from a sheet of a cheese-cloth one as a complete annulus *a* and the other as an inner annulus *b* with three radial spokes *c*, *d*, *e*. The material is impregnated, preferably before the layers are stamped, with a liquid synthetic resin such as that sold under the Registered Trade Mark Bakelite. The amount of liquid necessary to impregnate the material without rendering it impervious to air depends largely on the material to be impregnated but may be determined by a simple trial. In the case of Bakelite, a 30 to 40 per cent. solution has been found suitable and the required amount is determined by passing the material after impregnation and whilst still wet, through a pair of rollers which can be adjusted within fine limits to provide a gap between them so that, without exerting pressure on the material, they will remove the surplus liquid. It will be readily understood that according to the relative thickness of the web and warp to the spaces between them and the nature of the thread from which the fabric is woven, various densities of solution will be required according to the nature of the material used for impregnation. After this treatment, the material may be cut into suitable lengths and suspended either in free air or suitable heated ovens to dry.

The two layers *a*, *b* after being cut to

shape are superimposed with their warps inclined to one another, for example, at 45 degrees and are corrugated as seen at *f* by being placed in a heated mould and compressed by a correspondingly shaped die. The resin is thus polymerised and renders the discs sufficiently resilient and their fibres waterproofed while the resulting spider is still pervious to the flow of air but prevents the passage of solid particles of such a size as to impair the efficient operation of the sound reproducing instrument.

By using a spoked inner annulus *b* cemented to a complete annulus *a* as shown, it is possible to house the two leads *g*, *h* to the voice coil of the instrument between two of the spokes *c*, *d* of the one layer *b* and the adjacent surface of the other layer *a*. The third spoke *e* may be similarly loaded with a strip *k* merely for balancing purposes. It is also possible by making the second layer *b* with spokes of appropriate width or with its inner annulus of suitable diameter or both to obtain a centring member of desired stiffness and consequently giving the finished sound-reproducing instrument a main resonant frequency desired.

The centring member is shown in Figure 2 in position in a typical loud-speaking telephone assembly. The centring member *a*, *b* and the magnet housing *l* are connected to the rear of the chassis *m* by bolts *n*, the rim of the annulus *a* and the legs *c*, *d*, *e* of the member *b* being clamped between rings *o*, *p*, *q*. The conical diaphragm *r* carries the voice coil tube *s* at its neck, the coil being shown at *t*. The centring member *a*, *b* at the centre is secured to the coil tube *s* by adhesive. The central pole of the magnet is seen at *u* and the outer annular pole at *v*. It will be seen that air can pass through the centring member *a*, *b* to and from the space between it and the outer annular pole *v* and the centring member acts as an air filter preventing the entry of dust into that space.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A corrugated centring member for the moving coil of a moving-coil telephone comprising two superposed layers of fabric formed with interstices which allow the passage of air but prevent the passage of solid particles of such a size as to interfere with the free movement of the moving coil, each of the layers having the form of an annulus with the second of smaller radial depth than the first.

2. A corrugated centring member



according to claim 1, in which the second layer consists of an annulus with a number of radial spokes extending outwards approximately to the circumference of the first layer.

3. A corrugated centring member according to claim 2, in which the two connecting leads to the moving coil of the telephone are enclosed between two of the spokes of the second layer and the adjacent surface of the first layer.

4. A corrugated centring member according to any one of claims 1 to 3, in which the layers are formed of relatively open fabric impregnated with a plastic composition to such an extent as not to close the interstices in the fabric.

5. A corrugated centring member according to claim 4, in which the impregnating composition is a thermosetting synthetic resin, the temperature required for polymerising which is substantially above that at which the instrument is operated.

6. A corrugated centring member for a moving-coil telephone according to claim 1, constructed substantially as described with reference to the accompanying drawings.

Dated this 14th day of June, 1948.

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copies, price 2s. 0d. each (inland) 2s. 1d. (abroad) may be obtained.

[This Drawing is a reproduction of the Original on a reduced scale.]

